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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Indwelling Vein Cannula

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(73) Same as inventor

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ABSTRACT

The invention concerns an indwelling vein cannula with a cannula body comprising essentially a plastic cannula and a handle attachment, and with an inner puncture cannula comprising a metal cannula (stylet), the cannula body (2) including a flexing section (11) in the region of the handle attachment (3).

1. Indwelling vein cannula with a cannula body consisting essentially of a plastic cannula and a handle and with a piercing inside cannula having a metal cannula (trocar), characterized in that the cannula body (2) is provided at the handle (3) with a flexure (11).

2. Indwelling vein cannula according to claim 1, characterized in that the flexure (11) is so configured in its nature and length that flexing up to 90° is made possible.

3. Indwelling vein cannula according to claim 1 or 2, characterized in that the cannula body (2) is provided with a finger plate (12) at the handle.

4. Indwelling vein cannula according to claim 3, characterized in that the finger plate (12), adapted to the anatomy of a finger pad, is rounded.

5. Indwelling vein cannula according to claim 3 or 4, characterized in that nubs (13) are provided on the finger plate (12).

6. Indwelling vein cannula according to any one of claims 3 to 5, characterized in that the finger plate (12) forms the cover of a second port.

7. Indwelling vein cannula according to any one of claims 1 to 6, characterized in that the plastic cannula (4) has at least one cross bore (14) at its tip.

INDWELLING VEIN CANNULA

The invention relates to an indwelling vein cannula with a cannula body consisting substantially of a plastic cannula and a handle and having an internal piercing cannula provided with a metal cannula (trocar).

Intravenous injection and intravenous drip infusion are now indispensable in all of medical treatment. Their development was accomplished in many small steps and over a long period of time. Methods for phlebotomy and for medication have long been known.

The discovery of blood circulation early in the 17th century created the anatomic physiological basis regarding infusion and transfusion. Soon the first attempts at infusion were made, first in animals and later also in human beings, although initially neither any therapeutic effect nor any advancement of knowledge were obtained. Since the reason for the initial failures were probably to be attributed primarily to septic conditions, the invention of the injection syringe in the 19th century first opened the way to modern injection therapy. However, a new chapter in transfusion science was begun after the discovery of blood groups at the beginning of this century. Then the decisive bases and technologies could be developed which are largely what they are today due to the stimulus of the two world wars and the development of internal medicine and anesthesiology. In the meantime intravenous therapy for parenteral medication and for the replacement of blood by transfusion or infusion has become widespread.

All illnesses in which the medication is to act rapidly or cannot be administered in any other way are indications for intravenous injection. Precisely in connection with the latter type of cases, medication over a long period of time is required, so that intravenous drip infusion is used in administering the indicated

medication. In this case an indwelling vein cannula is used, whose function is to be described in detail herewith.

Regardless of the length of time and rate of infusion, first a suitable vein is selected. It is desirable in the case of an extended infusion therapy first to select veins located as distally as possible, so that if any thrombosis occurs, more proximally located open veins can be resorted to. In any case, veins adjacent to joints (wrists, elbows, etc.) must be avoided because otherwise when movement occurs the vein may be injured or even punctured no matter how the cannula is fixed in place. As the use of intravenous fluid treatment increases, a number of further developments of cannulae have come into use in the last few decades. Increasing preference is enjoyed by indwelling cannulae of plastic, of which the so-called "Braunüle" (registered trademark of D. Braun Melsungen AG) is most widely used.

The known plastic indwelling vein cannula consists first of an internal piercing cannula the tubular part of which consists of metal (so-called "trocar"), onto which a conically terminating, closely fitting plastic tube is slipped. The plastic tube is slightly shorter in length than the trocar and the transition to the conical part is made stepless at the tip of the cannula by precise machining, so that, if it is correctly handled, any deformation of the conical (plastic) tip of the cannula making the penetration of the tissue difficult will be prevented.

The manipulation of the known indwelling vein cannula is to be described herewith: After about 1/2 to 1 cm of the cannula has been inserted into the lumen of the vein, the metal trocar is retracted to such an extent that its tip is fully inside of the plastic cannula. Thus the chamber at the end of the plastic cannula fills with blood, thereby permitting inspection of the

location of the indwelling vein cannula. Then the plastic cannula, with the trocar completely sheathed in it, is advanced into the lumen all the way up to its handle while the vein is still blocked. This is the way in which the metal tip of the trocar is prevented from injuring the vein wall when the indwelling vein cannula is inserted, but the plastic cannula retains the necessary stiffness so as not to be kinked by the resistance of the skin to its advance. Finally, the indwelling vein cannula is fixed onto the skin by means of adhesive strips or the like at the contact wings provided on the cannula body, and the injection syringe or infusion system is connected to it.

As explained above, the known indwelling vein cannula has already been very far developed regarding its use. However, even after installation complications can develop due to the fact that reliable fixation at the site of the actual cannula is achieved, and yet the transition between the cannula chamber and the mouth of the infusion tube does not permit optimum fixation. Even in the case of small and therefore shorter indwelling vein cannulae, this portion of the indwelling vein cannula protrudes out of the fixated "triangle" (point of entry - right contact wing - left contact wing) in prolongation of the long axis of the cannula. Upon an incautious or unconscious movement of the patient, while asleep for example, it is therefore easily possible for this end of the cannula to be displaced. The infusion tube can come loose from the indwelling vein cannula or, due to the levering action of this protruding free end of the cannula, injuries can occur in the actual point of entry or in the interior of the vein.

It is therefore the object of the invention to configure and improve the above-described indwelling vein cannula so that the above-mentioned disadvantages will be avoided, and that the indwelling vein cannula will be improved in its entirety. It is

furthermore desired to facilitate the handling of the indwelling vein cannula and improve its operation without having to lose the known advantages. The indwelling vein cannula according to the invention, in which the above-described object is achieved, is characterized firstly, and essentially, by the fact that the cannula body is provided with a flexure at the point of attachment of the handle. By this configuration according to the invention it is brought about that movements transmitted to the indwelling vein cannula by the infusion tube can no longer be transmitted to the plastic cannula lying within the vein. Especially, the indwelling vein cannula can no longer act as a rigid lever in the area between the point of entry and the opening for receiving the injection syringe or infusion tube, so that the possibility of injury can be reliably forestalled.

The components referred to above as well as those claimed and those described in the examples of embodiment, which are to be used in accordance with the invention, are not subject to any special exceptional conditions as to their size, configuration, choice of material and technical conception, so that the criteria of choice known in their particular field of application can be applied without limitation, and especially they are usable independently of one another for the solution of the problem or of at least a part thereof.

There are different possibilities for embodying and developing the teaching of the invention; therefore the secondary claims on the one hand can be consulted in this regard, and on the other hand so can the following explanation of a preferred embodiment of the indwelling vein cannula in conjunction with the drawing, wherein:

Fig. 1 is a side view of the indwelling vein cannula according to the invention, in the assembled state with tip guard.

Fig. 2 is a side view of the indwelling vein cannula according to the invention in the disassembled state with the tip guard removed.

Fig. 3 is a side view of a part of the indwelling vein cannula according to the invention from Figure 2.

Fig. 4 is a side view of a part of the indwelling vein cannula according to the invention from Figure 2.

Fig. 5 is a plan view of the part of the indwelling vein cannula according to the invention from Figure 4, and

Fig. 6 is an enlarged section of the indwelling vein cannula according to the invention, on the circle in broken lines from Figs. 3 and 5.

Fig. 1 shows the indwelling vein cannula according to the invention, indicated as a whole at 1, in a side view. The indwelling vein cannula 1, regularly a disposable cannula, is in this assembled state before its first use. For greater clarity, the indwelling vein cannula 1 is shown in its individual components in a side view and plan view in Figures 2 and 3, respectively.

In particular, the indwelling vein cannula 1 according to the invention first has the cannula body 2 with handle connection 3 and the plastic cannula 4 formed thereon. Likewise formed thereon are the fixation wings 5 which serve as supporting and adhering means for fastening the indwelling vein cannula 1 on the skin. Their undersides are often provided with notches in order better to be adapted to the shape of an arm, for example.

Figures 1 to 3 furthermore show that, in the interior of the cannula body 2 made of plastic, there is an inside cannula equipped with a hollow metal needle, the so-called "trocar" 7. The tip of the trocar 7 is bevel-ground, as it appears quite clearly from Figures 2 and 3. For easier handling, the piercing inside cannula 6 is equipped with a holding lug 8. The indwelling vein cannula 1 is closed with a trocar cap 9 which is such that, when the trocar 7 is removed, this cap can also serve for sealing the cannula body 2. For that purpose, and also, of course, to accommodate an injection syringe or an infusion tube not shown, both the cannula body 2 and the inside cannula 6 are made hollow cylindrical at their end remote from the tip. Lastly, it can be seen in Figs. 2 and 3 that the indwelling vein cannulae 1 are provided with tip guards 10 to protect against injury and damage.

In accordance with the invention the end of the cannula body 2 remote from the tip is provided, at the point of attachment of the handle 3, with a flexure 11, so that the injection syringe or the end of the infusion tube no longer needs to be in line with the long axis of the cannula (not especially indicated in the drawing).

The operation of this flexure 11, which is known in other fields of application, can be clearly understood from Figures 4 and 5 which show the cannula body 2 in a side view and plan view, respectively. According to a further teaching of the invention, the flexure 11 is of such a nature and length that it permits bending over 90 degrees. In this manner, for example, an infusion tube can be attached to the indwelling vein cannula 1 perpendicular to the arm (and hence also perpendicular to the vein). Possible movements of the infusion tube are transmitted less to the cannula body 2 than in the case of conventional indwelling vein cannulae.

In further development of the invention, the cannula body 2 is provided with a finger plate 12 at the handle 3. It is especially advantageous if, according to a further teaching of the invention, the finger plate 12, adapted to the anatomy of the finger pad of an index finger, is curved in shape and/or provided with nubs 13 to prevent any slipping of the finger on the cannula body 2. The above-described configuration permits especially easy handling of the indwelling vein cannula 1 according to the invention, since it can be guided securely and nevertheless sensitively with three fingers, the index finger lying on the finger plate 12, and the thumb and middle finger laterally gripping the holding lug 8 of the inside piercing cannula 6. Here again can be seen the special advantage of the previously described configuration of the indwelling vein cannula 1 according to the invention, because laceration of the vein is a very frequent complication of phlebotomy, though in most cases it is harmless. One is taught to "hold the indwelling vein cannula lightly," so as to feel the resistance of the vein wall, and to guide the injection needle as sensitively as possible, so as to be able to set it immediately when blood enters the cannula. This recommendation is supported by the design described above.

It is not shown that indwelling vein cannulae are often provided with two ports, for example to permit the cannula to be flushed out. These are usually provided at the point of attachment of the cannula body at the fixation wings. Therefore it is desirable that, in the case of indwelling vein cannulae in accordance with the invention, the finger plate simultaneously form the cover of the second port.

Lastly, an additional teaching of the invention consists in providing at least one cross bore 14 at its tip. For easier comprehension, the area within the broken circle K of Figures 3

and 5 is shown enlarged in Fig. 6. In the embodiment shown, and to this extent preferred, the plastic cannula 4 shown only at its tip has one cross bore 14, but configurations with several cross bores are also conceivable. By means of these cross bores a uniform flow is achieved, and clogging (for example by blood clots due to contact between the tip of the cannula and the vein wall, or mechanical damage to the delicate, tapering cannula tip, etc.) can be reliably prevented.

Fig. 1

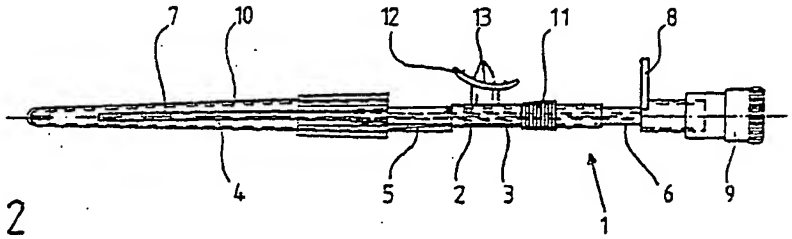

Fig. 2

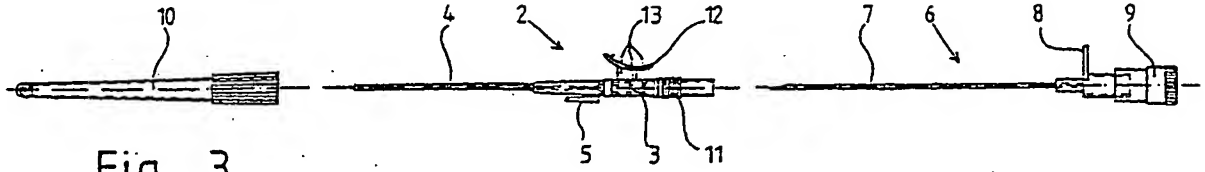

Fig. 3

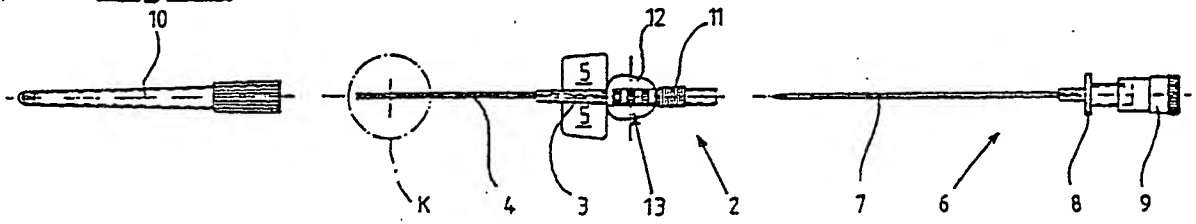

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Fig. 4

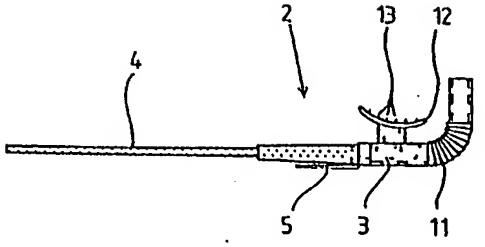


Fig. 5

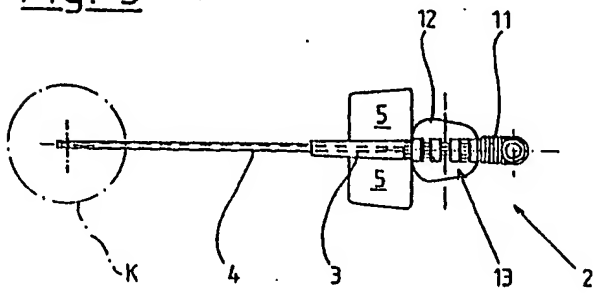
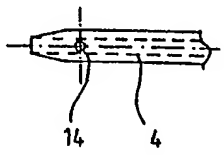


Fig. 6



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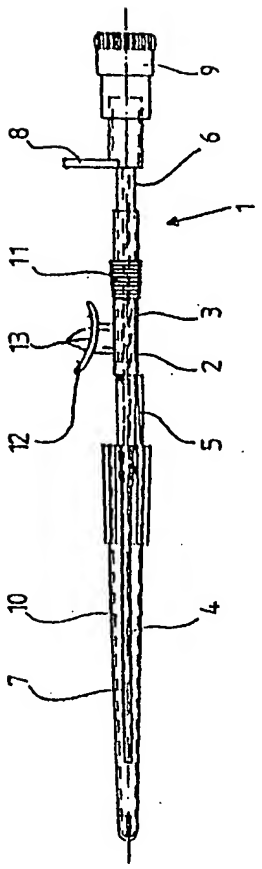
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